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(IBCS) VERIFICATION PLAN

JULY 1972

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	9					
	10			Test requirement clarification		
	11					
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1.0 INTRODUCTION

This verification plan is prepared in accordance to the requirements of Section 6.0 of the End Item Specification for the Inflight Blood Collection System (EIS IBCS), MSC-06761, and adheres to the guide lines established in Section 6.0 of the Apollo Applications Program, Ancillary Hardware General Requirements, MSC-KA-D-69-44 Revision A.

It defines the specific tests and methods used to verify that the IBCS meets the technical requirements of Sections 3.0 and 6.0 of MSC-06761.

2.0 APPLICABLE DOCUMENTS

The following documents, of the exact issue identified, form a part of this plan to the extent specified herein. In case of conflict, the requirements of this plan will apply.

2.1 STANDARDS

2.1.1 Military

Number	Title	Date
MIL-STD-810B, Notices 1 through 4	Environmental Test Methods	6-5-67 9-21-70

2.2 SPECIFICATIONS

2.2.1 NASA

Number	Title	Date
MSC-KA-D-69-44, Revision A	Apollo Applications Program, Ancillary Hardware General Requirements	2-4-70
MSC-06761	End Item Specification For Inflight Blood Collection System (IBCS)	3-30-72

3.0 VERIFICATION REQUIREMENTS

The methods used to verify that the IBCS meets the performance/design requirements of Section 3.0 of MSC-06761 are presented in the Verification Matrix, Figure 1, with references relating each requirement to a specific paragraph of this plan.

The tests used to verify that the IBCS meets the environmental requirements of Section 6.0 of MSC-06761 are presented in the Environmental Test Summary, Figure 2, with references relating each requirement to a specific paragraph of this plan. In addition, the sequence of test activity and elapsed time are illustrated in the Test Activity Flow Chart, Figure 3, and the Elapsed Time Sequence, Figure 4.

3.1 FACILITIES

3.1.1 MDC-East. Verification that the ASP's, centrifuges, syringes, Beta bags, tourniquets, swabs, and BSV's of the IBCS meet the requirements of Sections 3.0 and 6.0 of MSC-06761 will be performed at MDC-East. Test equipment requirements are as follows: A

Test Equipment	Purpose
Acceleration Test Stand	Acceleration Test
EMI Test Stand	EMI Test
Environmental Chambers	Altitude, Humidity, Pressure, and Temperature Tests
Functional Test Stand	Operational Evaluation
Microscope	Plasma Analysis
Shock Test Stand	Shock Test
Vibration Test Stand	Vibration Test

3.1.2 Carleton Controls. Verification that the ASPER of the IBCS meets the requirements of Sections 3.0 and 6.0 of MSC-06761 will be performed at Carleton Controls Corporation. Test equipment requirements are as follows:

Test Equipment	Purpose
Acceleration Test Stand	Acceleration Test
Environmental Chambers	Altitude, Humidity, Pressure, and Temperature Tests
Functional Test Stand	Operational Evaluation
Shock Test Stand	Shock Test
Vibration Test Stand	Vibration Test

3.1.3 NASA Center. Preinstallation tests will be performed by the installing contractor or NASA Center. Test equipment requirements are as follows:

Test Equipment	Purpose
Functional Test Stand	Operational Evaluation

3.1.4 Launch Site. Prelaunch tests will be performed at the launch site by the Integrated Systems contractor or NASA Center. There are no test equipment requirements at the launch site.

3.2 VERIFICATION METHODS

3.2.1 Assessment

3.2.1.1 Similarity. Verification by similarity is used when there is a relatively large number of items that are substantially similar or identical in design, manufacturing processes, and quality control to another item that has been previously qualified to equivalent or more stringent requirements. In this plan, it is used in conjunction with other verification methods to

verify that the ASP's, the BSV's, and the syringes meet their applicable technical requirements.

3.2.1.2 Analysis. Verification by analysis is used when a generally accepted analytical technique will verify that an item meets applicable requirements. In this plan, it is used as noted in Figure 1 in lieu of test activity to qualify the IBCS.

3.2.1.3 Inspection. Verification by inspection is used when inspection techniques will verify that an item meets applicable requirements. In this plan, it is used when inspection techniques are adequate to assure that the IBCS meets its technical requirements.

3.2.1.4 Demonstration. Verification by demonstration is used when a simple demonstration will verify that an item meets applicable requirements. In this plan, it is used when an operational and/or functional demonstration is adequate to qualify the IBCS.

3.2.2 Test

3.2.2.1 Development. Development tests, in general, verify the feasibility of a design approach by evaluating hardware failure modes, design margins, performance under simulated or actual environmental conditions and provide confidence in the ability of the hardware to pass qualification tests. In this plan, verification by developmental tests is confirmed by a review of laboratory records.

3.2.2.2 Qualification. Qualification tests verify that Flight Hardware design meets applicable technical requirements to assure operational suitability in anticipated environments. Qualification Test Hardware is identical

in configuration and production processing to Flight Hardware or similar as established in accordance to the requirements of Section 6.2.1 of MSC-06761. In this plan, the qualification test environments and methods of MIL-STD-810, Section 3.0, are used in the Qualification Test Program and are identified in the Environmental Test Summary, Figure 2. In addition, the sequence of test activity is illustrated in the Test Acitivity Flow Chart, Figure 3. Qualification Test Specification and Qualification Test Procedures will be prepared and approved by MSC prior to the initiation of test activity and a formal report of test results will be submitted for approval at the completion of the Qualification Test Program. Verification by qualification tests is confirmed by the ability of the IBCS to meet the requirements of the Qualification Test Program and by a review of the test results as reported in the Qualification Test Reports. A

The number of test articles that are required for the IBCS qualification and that are deliverable as Qualification Test Hardware is as follows:

36 ASP's
1 ASPER
1 Beta Bag
13 BSV's
1 Centrifuge A
36 Syringes
2 Tourniquets
60 Swabs

3.2.2.3 Acceptance. Acceptance tests verify that all hardware meets applicable technical requirements and are acceptable. Each centrifuge and ASPER will be acceptance tested, whereas the ASP's and BSV's will be acceptance tested by sampling 10 percent of each lot. The acceptance test environments are identified in the Environmental Test Summary, Figure 2. A

In addition, the sequence of test activity is illustrated in the Test Activity Flow Chart, Figure 3. Acceptance Test Specifications and Acceptance Test Procedures will be prepared and approved by MSC prior to the initiation of test activity and a formal report of test results will be submitted for approval at the completion of the Acceptance Test Program. Verification by acceptance tests is confirmed by the ability of the IBCS to meet the requirements of the Acceptance Test Program and by a review of the test results as reported in the Acceptance Test Reports. A

3.2.2.4 Preinstallation. Preinstallation tests verify that hardware was not damaged during handling or shipment after the acceptance tests and that its performance capabilities has not deteriorated. In this plan, preinstallation tests are conducted on all end items after receipt for installation by a NASA Center. Verification by preinstallation tests is confirmed by the ability of the IBCS to meet the requirements of the Preinstallation Test Program and by a review of the test results as reported in the Preinstallation Test Reports.

3.2.2.5 Integrated Systems. Integrated Systems Tests verify that hardware, when integrated with mating systems hardware, is functionally and operationally compatible. In this plan, the Integrated Systems Tests are conducted by a NASA Center with contractor input to assure proper storage and installation of the IBCS. B

3.2.2.6 Prelaunch. Prelaunch Tests verify that the integrated flight vehicle systems are ready for launch. In this plan, the Prelaunch Tests are conducted by a NASA Center with contractor input to assure proper stowage and installation of the IBCS. B

3.2.2.7 Other. Not applicable.

3.3 DOCUMENTATION. Documents resulting from this plan are as follows:

3.3.1 Qualification Test Specification

3.3.2 Qualification Test Procedure

3.3.3 Qualification Test Report

3.3.4 Acceptance Test Specification

3.3.5 Acceptance Test Procedure

3.3.6 Acceptance Test Report.

4.0 CONFIGURATION DEVIATION

The end item baseline configuration as established at the Critical Design Review, (CDR), will be changed only through approval of Engineering Change Proposals (ECP) submitted in accordance with Paragraph 8.1.3 of MSC-06761. Where the proposed change recommends modification to this plan and/or MSC-06761, the ECP will be submitted with a preliminary Specification Change Notice (SCN) attached in accordance with Paragraph 8.1.4 of MSC-06761. All ECP's and SCN's will be reviewed and approved by the Manned Spacecraft Center (MSC) prior to their implementation. A A

VERIFICATION MATRIX

VERIFICATION METHOD

TEST

A. DEVELOPMENT
B. QUALIFICATION
C. ACCEPTANCE
D. PREINSTALLATION
E. INTEGRATED SYSTEMS
F. PRELAUNCH
G. OTHER

ASSESSMENT

a. SIMILARITY
b. ANALYSIS
c. INSPECTION
d. DEMONSTRATION

SECTION 3.0 END ITEM SPECIFICATION REFERENCE (PERFORMANCE/DESIGN REQUIREMENTS)	VERIFICATION METHOD											VERIFICATION PLAN REFERENCE
	TEST							ASSESSMENT				
	A	B	C	D	E	F	G	a	b	c	d	
3.1 PERFORMANCE	-	-	-	-	-	-	-	-	-	-	-	-
3.1.1 Functional	X	X	-	-	-	-	-	-	-	-	-	3.2.2.1, 3.2.2.2
3.1.1.1 Overall System Requirements	-	-	-	-	-	-	-	-	-	-	-	-
3.1.1.1.1 ASP	X	X	X	-	-	-	-	X	-	-	-	3.2.2.1, 3.2.2.2 3.2.2.3, 3.2.1.1
3.1.1.1.2 Centrifuge	X	X	X	-	-	-	-	-	-	-	-	3.2.2.1, 3.2.2.2 3.2.2.3
3.1.1.1.3 BSV	X	X	X	-	-	-	-	X	-	-	-	3.2.2.1, 3.2.2.2, 3.2.2.3, 3.2.1.1
3.1.1.1.4 ASPER	X	X	X	-	-	-	-	-	-	-	-	3.2.2.1, 3.2.2.2 3.2.2.3
3.1.1.5 Syringe	-	X	X	-	-	-	-	X	-	-	-	3.2.2.3 3.2.1.1
3.1.1.2 Subsystem Requirements	-	-	-	-	-	-	-	-	-	-	-	-
3.1.1.2.1 Mechanical	-	-	-	-	-	-	-	-	-	-	-	-
3.1.1.2.1.1 Enclosure	-	-	-	-	-	-	-	-	-	-	-	-
a ASP	-	X	X	-	-	-	-	-	-	-	-	3.2.2.2, 3.2.2.3
b Centrifuge	-	X	X	-	-	-	-	-	-	-	-	3.2.2.2, 3.2.2.3
c BSV	-	X	X	-	-	-	-	-	-	-	-	3.2.2.2, 3.2.2.3
d ASPER	-	X	X	-	-	-	-	-	-	-	-	3.2.2.2, 3.2.2.3
e Syringe	-	X	X	-	-	-	-	-	-	-	-	3.2.2.2, 3.2.2.3

A

A

FIGURE 1 - VERIFICATION MATRIX

(cont'd)

VERIFICATION MATRIX

VERIFICATION METHOD

TEST

A. DEVELOPMENT
B. QUALIFICATION
C. ACCEPTANCE
D. PREINSTALLATION
E. INTEGRATED SYSTEMS
F. PRELAUNCH
G. OTHER

ASSESSMENT

a. SIMILARITY
b. ANALYSIS
c. INSPECTION
d. DEMONSTRATION

SECTION 3.0 END ITEM SPECIFICATION REFERENCE (PERFORMANCE/DESIGN REQUIREMENTS)	VERIFICATION METHOD											VERIFICATION PLAN REFERENCE	
	TEST							ASSESSMENT					
	A	B	C	D	E	F	G	a	b	c	d		
3.1.1.2.1.2 Weight	-	-	-	-	-	-	-	-	-	-	-	-	
a ASP	X	-	X	-	-	-	-	X	-	-	-	3.2.2.1, 3.2.2.3 3.2.1.1	A
b Centrifuge	-	-	X	-	-	-	-	-	-	-	-	3.2.2.3	
c BSV	-	-	X	-	-	-	-	X	-	-	-	3.2.2.3, 3.2.1.1	
d ASPER	-	-	X	-	-	-	-	-	-	-	-	3.2.2.3	
e Syringe	X	-	X	-	-	-	-	X	-	-	-	3.2.2.1, 3.2.2.3 3.2.1.1	A
3.1.1.2.1.3 Size	-	-	-	-	-	-	-	-	-	-	-	-	
a ASP	X	-	X	-	-	-	-	X	-	-	-	3.2.2.1, 3.2.2.3 3.2.1.1	
b Centrifuge	X	-	X	-	-	-	-	-	-	-	-	3.2.2.1, 3.2.2.3	
c BSV	X	-	X	-	-	-	-	X	-	-	-	3.2.2.1, 3.2.2.3 3.2.1.1	
d Stowage Pouch	X	-	X	-	-	-	-	-	-	-	-	3.2.2.1, 3.2.2.3	
e ASPER	X	-	X	-	-	-	-	-	-	-	-	3.2.2.1, 3.2.2.3	
f Syringe	X	-	X	-	-	-	-	X	-	-	-	3.2.2.1, 3.2.2.3 3.2.1.1	
3.1.1.2.1.4 Stowage	-	-	-	-	-	-	-	-	-	-	-	-	
a ASP and BSV	X	-	-	-	-	X	-	-	-	-	-	3.2.2.1, 3.2.2.6	A
b Centrifuge	-	-	-	-	-	X	-	-	-	-	-	3.2.2.6	
c ASPER	-	-	-	-	-	X	-	-	-	-	-	3.2.2.6	
d Syringe	-	-	-	-	-	X	-	-	-	-	-	3.2.2.6	

FIGURE 1 - VERIFICATION MATRIX (CONT'D)

(cont'd)

VERIFICATION MATRIX

VERIFICATION METHOD

TEST

A. DEVELOPMENT
B. QUALIFICATION
C. ACCEPTANCE
D. PREINSTALLATION
E. INTEGRATED SYSTEMS
F. PRELAUNCH
G. OTHER

ASSESSMENT

a. SIMILARITY
b. ANALYSIS
c. INSPECTION
d. DEMONSTRATION

SECTION 3.0 END ITEM SPECIFICATION REFERENCE (PERFORMANCE/DESIGN REQUIREMENTS)	VERIFICATION METHOD											VERIFICATION PLAN REFERENCE
	TEST							ASSESSMENT				
	A	B	C	D	E	F	G	a	b	c	d	
3.1.1.2.2 Electrical/Electronic	-	-	-	-	-	-	-	-	-	-	-	-
3.1.1.2.2.1 Power Consumption	X	X	X	-	-	-	-	-	-	-	-	3.2.2.1, 3.2.2.2 3.2.2.3
3.1.1.2.2.2 Operating Controls	X	-	X	-	-	-	-	-	-	-	-	3.2.2.1, 3.2.2.3
3.1.1.2.2.3 Operating Speed and Time	X	X	X	-	-	-	-	-	-	-	-	3.2.2.1, 3.2.2.2 3.2.2.3
3.1.1.2.2.4 Automatic Operation	X	X	X	-	-	-	-	-	-	-	-	3.2.2.1, 3.2.2.2 3.2.2.3
3.1.1.2.2.5 Manual Operation	X	X	X	-	-	-	-	-	-	-	-	3.2.2.1, 3.2.2.2 3.2.2.3
3.1.1.2.2.6 Speed Control	X	X	X	-	-	-	-	-	-	-	-	3.2.2.1, 3.2.2.2 3.2.2.3
3.1.1.2.2.7 Electrical Connector	X	X	X	-	-	-	-	-	-	-	-	3.2.2.1, 3.2.2.2 3.2.2.3
3.1.1.2.2.8 Power Interlock	X	X	X	-	-	-	-	-	-	-	-	3.2.2.1, 3.2.2.2 3.2.2.3
3.1.1.2.2.9 Dynamic Braking	X	X	X	-	-	-	-	-	-	-	-	3.2.2.1, 3.2.2.2 3.2.2.3
3.1.1.2.3 Other	-	-	-	-	-	-	-	-	-	-	-	-
3.1.1.2.3.1 Biomedical	X	X	-	-	-	-	-	-	-	-		3.2.2.1, 3.2.2.2
3.1.1.2.3.2 Anticoagulant	X	X	-	-	-	-	-	-	-	-	-	3.2.2.1, 3.2.2.2
3.1.1.2.3.3 Blood Fixative	X	X	-	-	-	-	-	-	-	-	-	3.2.2.1, 3.2.2.2
3.1.1.2.3.4 Marking	-	-	X	-	-	-	-	-	-	-		3.2.2.3
3.1.2 Operability	-	-	-	-	-	-	-	-	-	-	-	-
3.1.2.1 Reliability Design Goals (Numerical)	-	-	-	-	-	-	-	-	-	-	-	Not Applicable

FIGURE 1 - VERIFICATION MATRIX (CONT'D)

(cont'd)

VERIFICATION MATRIX

VERIFICATION METHOD

TEST

A. DEVELOPMENT
B. QUALIFICATION
C. ACCEPTANCE
D. PREINSTALLATION
E. INTEGRATED SYSTEMS
F. PRELAUNCH
G. OTHER

ASSESSMENT

a. SIMILARITY
b. ANALYSIS
c. INSPECTION
d. DEMONSTRATION

SECTION 3.0 END ITEM SPECIFICATION REFERENCE (PERFORMANCE/DESIGN REQUIREMENTS)	VERIFICATION METHOD											VERIFICATION PLAN REFERENCE
	TEST							ASSESSMENT				
	A	B	C	D	E	F	G	a	b	c	d	
3.1.2.2 Maintainability	-	-	-	-	-	-	-	-	-	-	-	-
3.1.2.2.1 General Requirements		-	-	-	-	-	-	-	-	-		-
a	-	-	-	-	-	-	-	-	-	-	X	3.2.1.4
b	-	-	-	-	-	-	-	-	-	-	X	3.2.1.4
c	-	-	-	-	-	-	-	-	-	-	X	3.2.1.4
d	-	-	-	-	-	-	-	-	-	-	X	3.2.1.4
3.1.2.2.2 Additional Requirements for In-Flight Maintainability	-	-	-	-	-	-	-	-	-	-	-	Not Applicable
3.1.2.3 Minimum Useful Life	-	X	-	-	-	-	-	-	-	-	-	3.2.2.2
3.1.2.4 Natural Environment	X	X	-	-	-	-	-	-	-	-	-	3.2.2.1, 3.2.2.2
3.1.2.5 Induced Environment	X	X	-	-	-	-	-	-	-	-	-	3.2.2.1, 3.2.2.2
3.1.2.6 Transportability	-	X	-	-	-	-	-	-	-	X	-	3.2.2.2
3.1.2.7 Human Engineering	X	-	-	-	-	-	-	-	-	-	X	3.2.1.4, 3.2.2.1
3.1.2.8 Safety	-	-	-	-	-	-	-	-	-	-	-	-
a	-	-	-	-	-	-	-	-	X	-	-	3.2.1.2
b	-	-	-	-	-	-	-	-	-	X	-	3.2.1.3
c	-	-	-	-	-	-	-	-	-	X	-	3.2.1.3
d	-	-	-	-	-	-	-	-	X	-	-	3.2.1.2

FIGURE 1 - VERIFICATION MATRIX (CONT'D)

(cont'd)

VERIFICATION MATRIX

VERIFICATION METHOD

TEST

A. DEVELOPMENT
B. QUALIFICATION
C. ACCEPTANCE
D. PREINSTALLATION
E. INTEGRATED SYSTEMS
F. PRELAUNCH
G. OTHER

ASSESSMENT

a. SIMILARITY
b. ANALYSIS
c. INSPECTION
d. DEMONSTRATION

SECTION 3.0 END ITEM SPECIFICATION REFERENCE (PERFORMANCE/DESIGN REQUIREMENTS)	VERIFICATION METHOD											VERIFICATION PLAN REFERENCE	
	TEST							ASSESSMENT					
	A	B	C	D	E	F	G	a	b	c	d		
e	-	-	-	-	-	-	-	-	-	-	-	Not Applicable	A
f	-	-	-	-	-	-	-	-	X	-	-	3.2.1.2	
g	-	-	-	-	-	-	-	-	X	-	-	3.2.1.2	
h	-	-	-	-	-	-	-	-	X	-	-	3.2.1.2	
i	-	-	X	-	-	-	-	-	-	-	-	3.2.2.3	A
j (1)	X	-	X	-	-	-	-	-	-	-	-	3.2.2.1, 3.2.2.3	
(2)	X	-	X	-	-	-	-	-	-	-	-	3.2.2.1, 3.2.2.3	
(3)	X	-	X	-	-	-	-	-	-	-	-	3.2.2.1, 3.2.2.3	
(4)	X	-	X	-	-	-	-	-	-	-	-	3.2.2.1, 3.2.2.3	
(5)	X	X	X	-	-	-	-	-	-	-	-	3.2.2.1, 3.2.2.2 3.2.2.3	
(6)	X	-	-	-	-	-	-	-	-	X	-	3.2.2.1, 3.2.1.2	
(7)	X	X	X	-	-	-	-	-	-	-	-	3.2.2.1, 3.2.2.2 3.2.2.3	A
3.2 INTERFACE REQUIREMENTS	-	-	-	-	-	-	-	-	-	-	-	-	
3.2.1 Flight Hardware	-	-	-	-	-	-	-	-	-	-	-	-	
3.2.1.1 Flight Vehicle Interfaces	-	-	-	-	-	-	-	-	-	-	-	-	
3.2.1.1.1 Location, Envelope, Weight and Center of Gravity	-	-	-	-	-	-	-	-	-	-	-	-	
3.2.1.1.1.1 Location	-	-	-	-	-	X	-	-	-	-	-	3.2.2.6	

FIGURE 1 - VERIFICATION MATRIX (CONT'D)

(cont'd)

VERIFICATION MATRIX

VERIFICATION METHOD

TEST

A. DEVELOPMENT
B. QUALIFICATION
C. ACCEPTANCE
D. PREINSTALLATION
E. INTEGRATED SYSTEMS
F. PRELAUNCH
G. OTHER

ASSESSMENT

a. SIMILARITY
b. ANALYSIS
c. INSPECTION
d. DEMONSTRATION

SECTION 3.0 END ITEM SPECIFICATION REFERENCE (PERFORMANCE/DESIGN REQUIREMENTS)	VERIFICATION METHOD											VERIFICATION PLAN REFERENCE
	TEST							ASSESSMENT				
	A	B	C	D	E	F	G	a	b	c	d	
3.2.1.1.1.2 Envelope	-	-	X	-	-	-	-	X	-	-	-	3.2.2.3, 3.2.1.1
3.2.1.1.1.3 Weight	-	-	X	-	-	-	-	X	-	-	-	3.2.2.3, 3.2.1.1
3.2.1.1.1.4 Center of Gravity	-	-	-	-	-	-	-	X	X	-	-	3.2.1.2
3.2.1.1.2 Structual	-	-	-	-	-	X	-	-	-	-	-	3.2.2.6
3.2.1.1.3 Fluid (Gas and Liquid)	-	-	-	-	-	-	-	-	-	-	-	Not Applicable
3.2.1.1.4 Electrical	-	X	X	-	-	-	-	-	-	-	-	3.2.2.2, 3.2.2.3
3.2.1.1.5 Communications and Instrumentation	-	-	-	-	-	-	-	-	-	-	-	Not Applicable
3.2.1.1.6 Environmental Control	-	-	-	-	-	-	-	-	-	-		Not Applicable
3.2.1.1.7 Controls and Displays (All)	X	X	X	-	-	-	-	-	-	X	-	3.2.2.1, 3.2.2.2 3.2.2.3
3.2.1.1.8 Lighting	-	-	-	-	-	-	-	-	-	-	-	Not Applicable
3.2.1.1.9 Other		X	-	-	-	-	-	X	-	-	-	3.2.2.2, 3.2.1.1
3.2.1.2 Interfaces with Experiment Flight Hardware	-	-	-	-	-	-	-	-	-	-	-	Not Applicable
3.2.1.3 Ground Communications Interfaces	-	-	-	-	-	-	-	-	-	-	-	Not Applicable
3.2.1.4 Flight Crew Interface	-	-	-	-	X	-	-	-	-	-	-	3.2.2.5
3.2.1.5 Mission Interfaces	-	-	-	-	X	-	-	-	-	-	-	3.2.2.5
3.2.1.6 Ground Support Equipment	-	-	-	-	-	-	-	-	-	-	-	Not Applicable

FIGURE 1 - VERIFICATION MATRIX (CONT'D)

(cont'd)

VERIFICATION MATRIX

VERIFICATION METHOD

TEST

A. DEVELOPMENT
B. QUALIFICATION
C. ACCEPTANCE
D. PREINSTALLATION
E. INTEGRATED SYSTEMS
F. PRELAUNCH
G. OTHER

ASSESSMENT

a. SIMILARITY
b. ANALYSIS
c. INSPECTION
d. DEMONSTRATION

SECTION 3.0 END ITEM SPECIFICATION REFERENCE (PERFORMANCE/DESIGN REQUIREMENTS)	VERIFICATION METHOD											VERIFICATION PLAN REFERENCE
	TEST							ASSESSMENT				
	A	B	C	D	E	F	G	a	b	c	d	
3.2.2 Zero Gravity Training Hardware	-	-	-	-	-	-	-	-	-	-	-	Not Applicable
3.2.3 Neutral Buoyancy Type Training Hardware	-	-	-	-	-	-	-	-	-	-	-	Not Applicable
3.2.4 Simulator Type Training Hardware	-	-	-	-	-	-	-	-	-	-	-	Not Applicable
3.2.4.1 Simulation Devices	-	-	-	-	-	-	-	-	-	-	-	Not Applicable
3.2.4.2 Simulators	-	-	-	-	-	-	-	-	-	-	-	Not Applicable
3.3 DESIGN AND CONSTRUCTION	-	-	-	-	-	-	-	-	X	-	-	3.2.1.2
3.3.1 Mechanical	-	-	-	-	-	-	-	-	-	-	-	-
3.3.1.1 Rigging Devices	-	-	-	-	-	-	-	-	-	-	-	Not Applicable
3.3.1.2 Shatterable Material	-	-	-	-	-	-	-	-	-	X	-	3.2.1.3
3.3.1.3 Restriction on Coatings	-	-	-	-	-	-	-	-	-	X	-	3.2.1.3
3.3.1.4 Decompression	X	X	-	-	-	-	-	-	-	-	-	3.2.2.1, 3.2.2.2
3.3.1.5 Mechanical Locks	-	X	X	-	-	-	-	-	-	-	-	3.2.2.2, 3.2.2.3
3.3.1.6 Weight and Size	-	-	-	-	-	-	-	-	-	-	X	3.2.1.4
3.3.1.7 Factors of Safety	-	-	-	-	-	-	-	-	-	-	-	-
3.3.1.7.1 Structural	-	-	-	-	-	-	-	-	X	-	-	3.2.1.2
3.3.1.7.2 Fluid Systems (Gas and Liquid	-	-	-	-	-	-	-	-	-	-	-	Not Applicable

FIGURE 1 - VERIFICATION MATRIX (CONT'D)

(cont'd)

VERIFICATION MATRIX

VERIFICATION METHOD

TEST

A. DEVELOPMENT
B. QUALIFICATION
C. ACCEPTANCE
D. PREINSTALLATION
E. INTEGRATED SYSTEMS
F. PRELAUNCH
G. OTHER

ASSESSMENT

a. SIMILARITY
b. ANALYSIS
c. INSPECTION
d. DEMONSTRATION

SECTION 3.0 END ITEM SPECIFICATION REFERENCE (PERFORMANCE/DESIGN REQUIREMENTS)	VERIFICATION METHOD											VERIFICATION PLAN REFERENCE
	TEST							ASSESSMENT				
	A	B	C	D	E	F	G	a	b	c	d	
a Low Pressure Systems	-	X	-	-	-	-	-	-	-	-	-	3.2.2.2
b High Pressure Systems	-	-	-	-	-	-	-	-	-	-	-	Not Applicable
c Propellant Tanks and High Pressure Vessels	-	-	-	-	-	-	-	-	-	-	-	Not Applicable
3.3.1.8 Lubrication	-	-	-	-	-	-	-	X	-	-	-	3.2.1.1
3.3.2 Electrical and Electronic	-	-	-	-	-	-	-	-	-	-	-	-
3.3.2.1 Flammability of Wiring Insulation, Materials and Accessories	-	-	-	-	-	-	-	-	X	-	-	3.2.1.2
3.3.2.2 Toxicity of Wiring Insulation, Materials and Accessories	-	-	-	-	-	-	-	-	X	-	-	3.2.1.2
3.3.2.3 Electrical Connectors - Keying	-	-	-	-	-	-	-	-	-	X	-	3.2.1.3
3.3.2.4 Electrical Connectors - Pin Assignment and Pin or Socket Selection	-	-	-	-	-	-	-	-	-	-	-	-
a	-	-	-	-	-	-	-	-	-	X	-	3.2.1.3
b	-	-	-	-	-	-	-	-	-	X	-	3.2.1.3
3.3.2.5 Electrical Connectors - Projective Covers or Caps	-	-	-	-	-	-	-	-	-	X	-	3.2.1.3
a	-	-	-	-	-	-	-	-	-	X	-	3.2.1.3
b	-	-	-	-	-	-	-	-	-	X	-	3.2.1.3

FIGURE 1 - VERIFICATION MATRIX (CONT'D)

(cont'd)

VERIFICATION MATRIX

VERIFICATION METHOD

TEST

A. DEVELOPMENT
B. QUALIFICATION
C. ACCEPTANCE
D. PREINSTALLATION
E. INTEGRATED SYSTEMS
F. PRELAUNCH
G. OTHER

ASSESSMENT

a. SIMILARITY
b. ANALYSIS
c. INSPECTION
d. DEMONSTRATION

SECTION 3.0 END ITEM SPECIFICATION REFERENCE (PERFORMANCE/DESIGN REQUIREMENTS)	VERIFICATION METHOD											VERIFICATION PLAN REFERENCE
	TEST							ASSESSMENT				
	A	B	C	D	E	F	G	a	b	c	d	
c	-	-	-	-	-	-	-	-	-	X	-	3.2.1.3
d	-	-	-	-	-	-	-	-	-	X	-	3.2.1.3
e	-	-	-	-	-	-	-	-	-	X	-	3.2.1.3
f	-	-	-	-	-	-	-	-	-	X	-	3.2.1.3
3.3.2.6 Materials Detrimental to Electrical Connectors	-	-	-	-	-	-	-	-	X	-	-	3.2.1.2
3.3.2.7 Electrical and Electronic Piece Parts - Closure	-	-	-	-	-	-	-	-	X	-	-	3.2.1.2
3.3.2.8 Protection of Exposed Electrical Circuits	-	-	-	-	-	-	-	-	-	-	-	Not Applicable
3.3.2.9 Protection of Electrical and Electronic Devices	-	-	-	-	-	-	-	-	-	-	X	3.2.1.4
3.3.2.10 Corona Suppression (All)		-	-	-	-	-	-	-	X	-	-	3.2.1.2
3.3.2.11 Moisture Protection of Electrical and Electronic Devices	-	X	-	-	-	-	-	-	-	-	-	3.2.2.2
3.3.2.12 Redundant Electrical Circuits	-	-	-	-	-	-	-	-	-	-	-	Not Applicable
3.3.2.13 Electrical Operating Requirements	-	-	-	-	-	-	-	-	-	-	-	-
a	X	X	X	-	-	-	-	-	-	-	-	3.2.2.1, 3.2.2.2 3.2.2.3
b	-	X	-	-	-	-	-	-	-	-	-	3.2.2.2

FIGURE 1 - VERIFICATION MATRIX (CONT'D)

(cont'd)

VERIFICATION MATRIX

VERIFICATION METHOD

TEST

A. DEVELOPMENT
B. QUALIFICATION
C. ACCEPTANCE
D. PREINSTALLATION
E. INTEGRATED SYSTEMS
F. PRELAUNCH
G. OTHER

ASSESSMENT

a. SIMILARITY
b. ANALYSIS
c. INSPECTION
d. DEMONSTRATION

SECTION 3.0 END ITEM SPECIFICATION REFERENCE (PERFORMANCE/DESIGN REQUIREMENTS)	VERIFICATION METHOD											VERIFICATION PLAN REFERENCE
	TEST							ASSESSMENT				
	A	B	C	D	E	F	G	a	b	c	d	
3.3.2.14 Temperature Control	-	-	-	-	-	-	-	-	-	-	-	Not Applicable
3.3.2.15 Wire Splicing	-	-	-	-	-	-	-	-	-	X	-	3.2.1.3
3.3.2.16 Wire Bundle and Harness Protection	-	-	-	-	-	-	-	-	-	X	-	3.2.1.3
3.3.3 Fluid (Gas and Liquid)	-	-	-	-	-	-	-	-	-	-	-	-
3.3.3.1 Flow Restriction Requirements	-	-	-	-	-	-	-	-	-	-	-	Not Applicable
3.3.3.2 Fluid Line Installation	-	-	-	-	-	-	-	-	-	-	-	Not Applicable
3.3.3.3 Service Points (All)	-	-	-	-	-	-	-	-	-	X	-	3.2.1.3
3.3.3.4 Protection for Fluid System Tubing, Fittings and Components (All)	-	-	-	-	-	-	-	-	-	X	-	3.2.1.3
3.3.3.5 Joining of Stainless Steel Tubing and Fittings	-	-	-	-	-	-	-	-	-	-	-	Not Applicable
3.3.3.6 Flushing of Fluid Systems	-	-	-	-	-	-	-	-	-	-	-	Not Applicable
3.3.3.7 Stress Corrosion	-	-	-	-	-	-	-	-	X	-	-	3.2.1.2
3.3.3.8 Use of Titanium, Titanium Alloys and Inconels (All)	-	-	-	-	-	-	-	-	X	-	-	3.2.1.2
3.3.3.9 Moisture Separation in Zero-G Environment	-	-	-	-	-	-	-	-	-	-	-	Not Applicable
3.3.3.10 System Venting	-	-	-	-	-	-	-	-	-	-	-	Not Applicable
3.3.3.11 Hazardous Fluids Systems	-	-	-	-	-	-	-	-	-	-	-	Not Applicable

FIGURE 1 - VERIFICATION MATRIX (CONT'D)

(cont'd)

VERIFICATION MATRIX

VERIFICATION METHOD

TEST

A. DEVELOPMENT
B. QUALIFICATION
C. ACCEPTANCE
D. PREINSTALLATION
E. INTEGRATED SYSTEMS
F. PRELAUNCH
G. OTHER

ASSESSMENT

a. SIMILARITY
b. ANALYSIS
c. INSPECTION
d. DEMONSTRATION

SECTION 3.0 END ITEM SPECIFICATION REFERENCE (PERFORMANCE/DESIGN REQUIREMENTS)	VERIFICATION METHOD											VERIFICATION PLAN REFERENCE	
	TEST							ASSESSMENT					
	A	B	C	D	E	F	G	a	b	c	d		
3.3.4 Debris Protection (All)	-	-	-	-	-	-	-	-	-	X	-	3.2.1.3	
3.3.5 Cleanliness	-	-	-	-	-	-	-	-	-	X	-	3.2.1.3	
3.3.6 Test Provisions (All)	-	-	-	-	-	-	-	-	-	-	-	Not Applicable	A
3.3.7 Single Point Failures	-	-	-	-	-	-	-	-	X	-	-	3.2.1.2	
3.3.8 Redundancy	-	-	-	-	-	-	-	-	-	-	-	-	
3.3.8.1 Separation of Redundant Paths	-	-	-	-	-	-	-	-	-	-	-	Not Applicable	A
3.3.8.2 Redundant Paths	-	-	-	-	-	-	-	-	-	-	-	Not Applicable	A
3.3.9 Selection of Specifications and Standards	-	-	-	-	-	-	-	-	-	-	-	-	
3.3.9.1 Order of Precedence (All)	-	-	-	-	-	-	-	-	X	-	-	3.2.1.2	
3.3.9.2 Electrical, Electronic and Electromechanical Parts Specifications (All)	-	-	-	-	-	-	-	-	X	-	-	3.2.1.2	
3.3.10 Materials, Parts and Processes	-	-	-	-	-	-	-	-	X	-	-	3.2.1.2	
3.3.10.1 Toxicity of Materials	-	-	-	-	-	-	-	-	-	-	-	-	
a	X	-	-	-	-	-	-	-	-	-	-	3.2.2.1	A
b	-	-	-	-	-	-	-	-	-	-	-	Not Applicable	A
3.3.10.2 Restriction on Use of Transistors and Capacitors	-	-	-	-	-	-	-	-	X	X	-	3.2.1.3	

FIGURE 1 - VERIFICATION MATRIX (CONT'D)

(cont'd)

VERIFICATION MATRIX

VERIFICATION METHOD

TEST

A. DEVELOPMENT
B. QUALIFICATION
C. ACCEPTANCE
D. PREINSTALLATION
E. INTEGRATED SYSTEMS
F. PRELAUNCH
G. OTHER

ASSESSMENT

a. SIMILARITY
b. ANALYSIS
c. INSPECTION
d. DEMONSTRATION

SECTION 3.0 END ITEM SPECIFICATION REFERENCE (PERFORMANCE/DESIGN REQUIREMENTS)	VERIFICATION METHOD											VERIFICATION PLAN REFERENCE
	TEST							ASSESSMENT				
	A	B	C	D	E	F	G	a	b	c	d	
3.3.10.3 Soldering	-	-	-	-	-	-	-	-	-	X	-	3.2.1.3
3.3.10.4 Welding and Brazing	-	-	-	-	-	-	-	-	-	X	-	3.2.1.3
3.3.10.5 Ultrasonic Cleaning	-	-	-	-	-	-	-	-	-	X	-	3.2.1.3
3.3.10.6 Etching of Wire Insulation for Potting	-	-	-	-	-	-	-	-	-	X	-	3.2.1.3
3.3.10.7 Adhesive Bonding	-	-	-	-	-	-	-	-	-	X	-	3.2.1.3
3.3.10.8 Restriction on Use of Mercury	-	-	-	-	-	-	-	-	X	-	-	3.2.1.2
3.3.10.9 Parts and Materials Selection	-	-	-	-	-	-	-	-	X	-	-	3.2.1.2
3.3.10.9.1 Controlled Electrical, Electronic and Electro-Mechanical Parts (All)	-	-	-	-	-	-	-	-	X	-	-	3.2.1.2
3.3.10.9.2 Nonmetallic Parts	-	-	-	-	-	-	-	-	X	-	-	3.2.1.2
3.3.11 Standard Parts	-	-	-	-	-	-	-	-	X	-	-	3.2.1.2
3.3.12 Fungus Resistance	-	-	-	-	-	-	-	-	X	-	-	3.2.1.2
3.3.13 Corrosion Prevention	-	X	-	-	-	-	-	-	-	-	-	3.2.2.2
3.3.14 Interchangeability and Replaceability	-	-	-	-	-	-	-	-	-	X	-	3.2.1.3
3.3.15 Workmanship	-	-	X	-	-	-	-	-	-	-	-	3.2.2.3
3.3.16 Electromagnetic Interference (EMI) (All)	-	X	-	-	-	-	-	-	-	-	-	3.2.2.2

FIGURE 1 - VERIFICATION MATRIX (CONT'D)

(cont'd)

VERIFICATION MATRIX

VERIFICATION METHOD

TEST

A. DEVELOPMENT
B. QUALIFICATION
C. ACCEPTANCE
D. PREINSTALLATION
E. INTEGRATED SYSTEMS
F. PRELAUNCH
G. OTHER

ASSESSMENT

a. SIMILARITY
b. ANALYSIS
c. INSPECTION
d. DEMONSTRATION

SECTION 3.0 END ITEM SPECIFICATION REFERENCE (PERFORMANCE/DESIGN REQUIREMENTS)	VERIFICATION METHOD											VERIFICATION PLAN REFERENCE	
	TEST							ASSESSMENT					
	A	B	C	D	E	F	G	a	b	c	d		
3.3.17 Identification and Marking (All)	-	-	-	-	-	-	-	-	-	X	-	3.2.1.3	A
3.3.18 Storage	-	-	-	-	-	-	-	-	-	-	-	-	
3.3.18.1 Centrifuge	-	-	-	-	-	-	-	-	X	-	-	3.2.1.2	
3.3.18.2 ASP	-	-	-	-	-	-	-	-	X	-	-	3.2.1.2	
3.3.19 Pyrotechnic Devices	-	-	-	-	-	-	-	-	-	-	-	Not Applicable	A

FIGURE 1 - VERIFICATION MATRIX (CONT'D)

ENVIRONMENTAL TEST SUMMARY

VERIFICATION METHOD

TEST

A. DEVELOPMENT
B. QUALIFICATION
C. ACCEPTANCE
D. PREINSTALLATION
E. INTEGRATED SYSTEMS
F. PRELAUNCH
G. OTHER

ASSESSMENT

a. SIMILARITY
b. ANALYSIS
c. INSPECTION
d. DEMONSTRATION

SECTION 6.0 END ITEM SPECIFICATION REFERENCE (ENVIRONMENTAL REQUIREMENTS)	VERIFICATION METHOD											VERIFICATION PLAN REFERENCE
	TEST							ASSESSMENT				
	A	B	C	D	E	F	G	a	b	c	d	
6.3.2.1.2.1 Humidity		X	-	-		-			-			3.2.2.2
6.3.2.1.2.3 High Temperature		X	-	-		-			-			3.2.2.2
6.3.2.1.2.4 Low Temperature		X	-	-		-			-			3.2.2.2
6.3.2.1.2.5 Shock		X	-	-		-			-			3.2.2.2
6.3.2.1.2.6 Fungus		-	-	-		-			X			3.2.1.2
6.3.2.1.2.7 Pressure		X	-	-		-			-			3.2.2.2
6.3.2.1.2.8 Acceleration		X	-	-		-			-			3.2.2.2
6.3.2.1.2.9 Vibration		X	-	-		-			-			3.2.2.2
6.3.2.1.2.11 Altitude		X	-	-		-			-			3.2.2.2
6.3.2.1.2.13 Atmosphere Compatibility		X	-	-		-			-			3.2.2.2
6.3.2.1.2.14 Other Test Environments and Methods - EMI		X	-	-		-			-			3.2.2.2
6.3.3 Vibration Acceptance Test		-	X	-		-			-			3.2.2.3
6.3.3 Temperature Acceptance Test		-	X	-		-			-			3.2.2.3
6.3.4 Life Cycle Testing		X										3.2.2.2

FIGURE 2 - ENVIRONMENTAL TEST SUMMARY

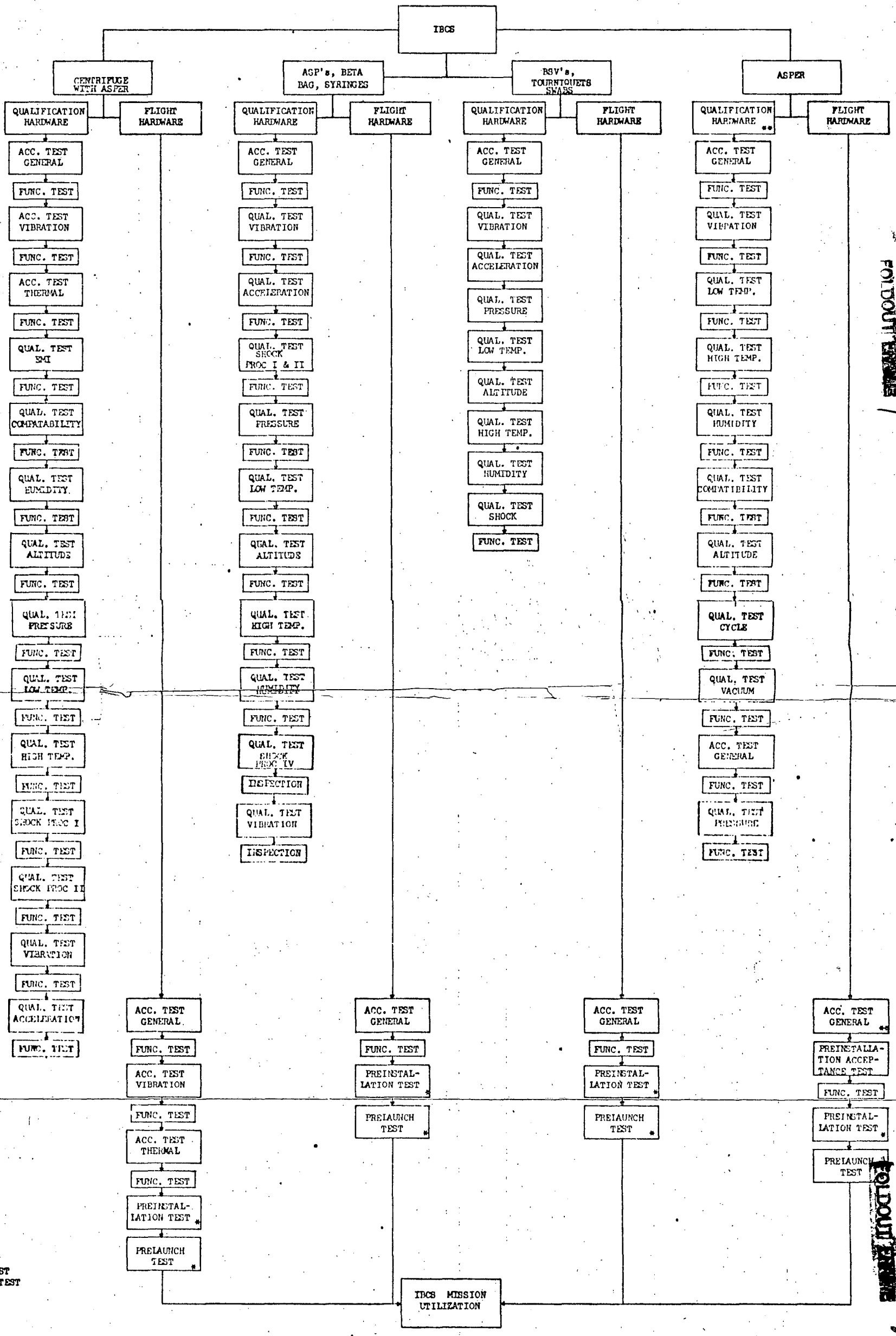

FIGURE 3 - TEST ACTIVITY FLOW CHART

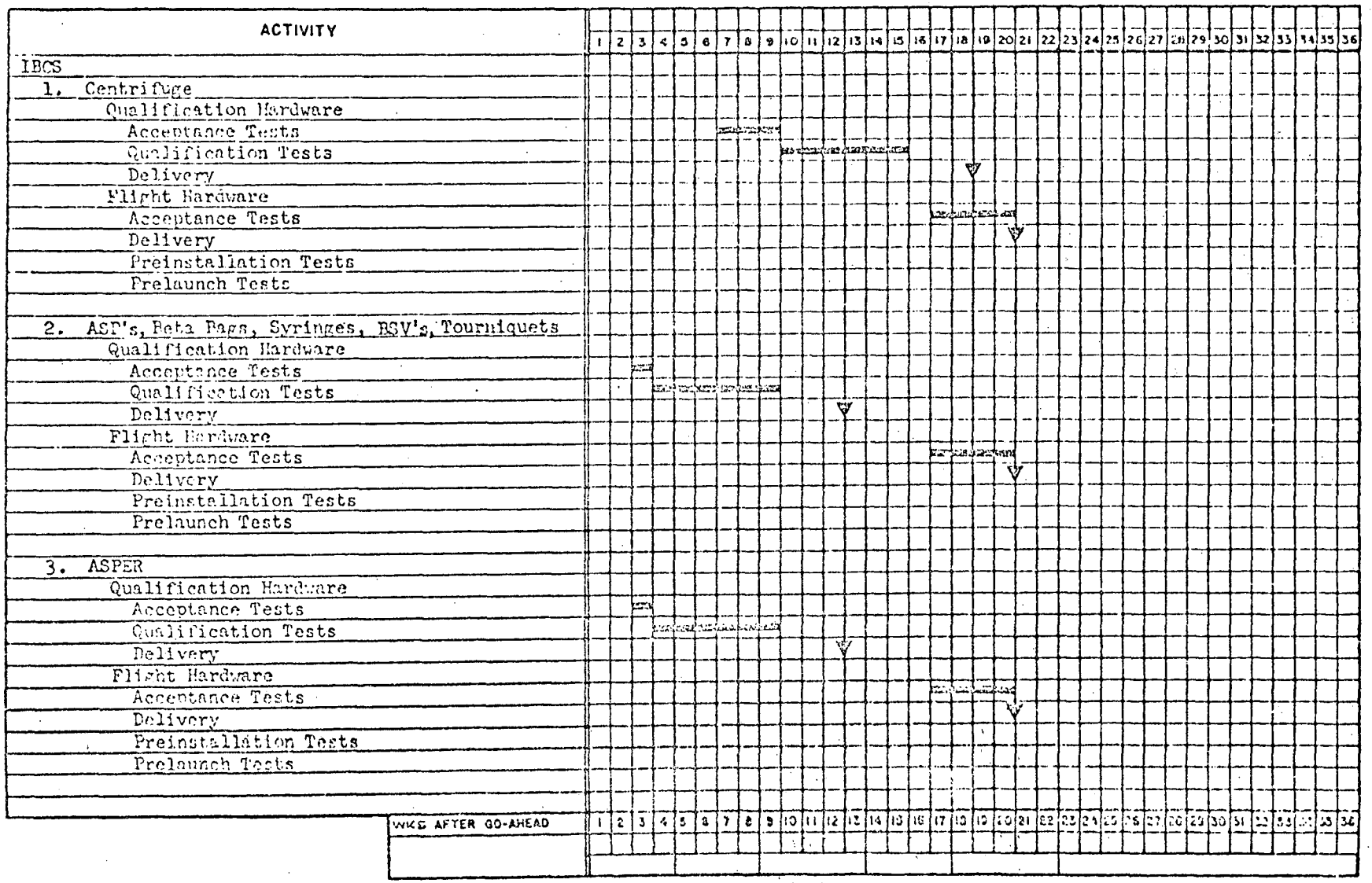

FIGURE 4 - ELAPSED TIME SEQUENCE

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